

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

- 1 1. (Currently Amended) An article of manufacture, comprising:
 - 2 a program storage device having stored thereon program instructions executable by a
 - 3 processing device to perform operations for estimating motion trials in video image sequences,
 - 4 the operations comprising:
 - 5 providing data points representing information from an image sequence; and
 - 6 performing regression clustering using a K-Harmonic Means function to cluster the data
 - 7 points and to provide motion information regarding the data points;
 - 8 wherein the performing regression clustering includes:
 - 9 selecting a number, K, of regression clusters $[[, K,]]$ for data points from an image
 - 10 sequence;
 - 11 initializing regression functions for each of the K clusters to estimate $[[\text{the}]]$
 - 12 centers of motion for the data points;
 - 13 calculating $[[\text{the}]]$ distances from each data point to each of the K regression
 - 14 functions;
 - 15 calculating a membership probability ~~and a weighting factor~~ for each data point
 - 16 based on distances between the K regression functions and each data point;
 - 17 applying regression ~~elustering using a K Harmonic Means function~~ to recalculate
 - 18 the K regression functions based at least on the membership probabilities;
 - 19 ~~comparing a change~~determining whether changes in membership
 - 20 ~~probabilities~~probability and a change ~~or changes~~ in the K regression functions satisfy a
 - 21 ~~stopping criterion; function to a predetermined threshold; and~~
 - 22 repeating calculating the distances, calculating the membership probability,
 - 23 applying regression, and determining whether changes satisfy the stopping criterion if the
 - 24 changes in membership probabilities or changes in the K regression functions do not
 - 25 satisfy the stopping criterion; and

26 using motion paths represented by the K regression functions ifwhen the
27 changeschange in membership probabilities or probability and changeschange in the K
28 regression functions satisfy the stopping criterionfunction are less than a predetermined
29 threshold.

1 2. (Original) The program storage device of claim 1, wherein the performing regression
2 clustering using the K-Harmonic Means function to cluster the data points and to provide motion
3 information regarding the data points further comprises providing motion vectors for the data
4 points.

1 3. (Original) The program storage device of claim 1, wherein the performing regression
2 clustering using the K-Harmonic Means function to cluster the data points and to provide motion
3 information regarding the data points further comprises providing at least one motion path for the
4 data points.

1 4. (Cancelled)

1 5. (Previously Presented) The program storage device of claim 1, wherein the initializing
2 regression functions for each of the K clusters further comprises randomly initializing regression
3 functions for each of the K clusters.

1 6. (Cancelled)

1 7. (Currently Amended) The program storage device of claim 1, wherein the program
2 instructions are executable to further calculate a weighting factor for each data point based on
3 distances between the K regression functions and each data point, wherein the weighting factor is
4 chosen to allow the K regression functions to be optimized with less sensitivity to initialization
5 of the K regression functions.

1 8. (Previously Presented) The program storage device of claim 1 further comprising
2 extracting data according to a predetermined criteria to provide the data points.

1 9. (Currently Amended) The program storage device of claim 8, wherein the extracting data
2 according to the predetermined criteria comprises portioning data according to color.

1 10. (Previously Presented) The program storage device of claim 1, wherein the program
2 instructions further include instructions for performing the operations comprising preparing each
3 of the data points as x-y-coordinate data points.

1 11. (Previously Presented) The program storage device of claim 1, wherein the program
2 instructions further include instructions for performing the operations comprising using the K
3 regression functions to render the image sequence with motion paths shown on a display.

1 12. (Currently Amended) The program storage device of claim 11, wherein the using the K
2 regression functions to render the image sequence further comprises overlaying the K regression
3 functions on the video images to show motion between the video images~~image sequences~~.

1 13. (Currently Amended) A system for estimating motion trials in video image sequences,
2 comprising:

3 an image sequence retrieval module for retrieving a current image and a first reference
4 image and providing data points representing information from the current image and the first
5 reference image; and

6 a motion estimator, coupled to the image sequence retrieval module, for performing
7 regression clustering using a K-Harmonic Means function to cluster the data points and to
8 provide motion information regarding the data points;

9 wherein the motion estimator performs regression clustering by selecting a number, K,
10 of regression clusters $[[, K,]]$ for data points from an image sequence, initializing regression
11 functions for each of the K clusters to estimate $[[\text{the}]]$ centers of motion for the data points,
12 calculating $[[\text{the}]]$ distances from each data point to each of the K regression functions,
13 calculating a membership probability ~~and a weighting factor~~ for each data point based on
14 distances between the K regression functions and each data point, applying regression ~~clustering~~
15 ~~using a K-Harmonic Means function to recalculate the K regression functions based at least on~~
16 ~~the membership probabilities, comparing a change determining whether changes in membership~~
17 ~~probability and a change probabilities or changes in the K regression functions satisfy a stopping~~
18 ~~criterion, repeating calculating the distances, calculating the membership probability, applying~~
19 ~~regression, and determining whether changes satisfy the stopping criterion if the changes in~~
20 ~~membership probabilities or changes in the K regression functions do not satisfy the stopping~~
21 ~~criterion, to a predetermined threshold and using motion paths represented by the K regression~~
22 ~~functions if the changes when the change in membership probability and change probabilities or~~
23 ~~changes in the K regression function functions satisfy the stopping criterion are less than a~~
24 ~~predetermined threshold.~~

1 14. (Original) The system of claim 13, wherein the motion information regarding the data
2 points further comprises motion vectors for the data points.

1 15. (Original) The system of claim 13, wherein the motion information regarding the data
2 points further comprises at least one motion path for the data points.

1 16. (Cancelled)

1 17. (Currently Amended) The system of claim 13, wherein the motion estimator is to
2 randomly initializes ~~initializes~~ regression functions for each of the K clusters.

1 18. (Cancelled)

1 19. (Currently Amended) The system of claim 13, wherein the motion estimator is to further
2 calculate a weighting factor for each data point based on distances between the K regression
3 functions and each data point, wherein the weighting factor is chosen to allow the K regression
4 functions to be optimized with less sensitivity to initialization of the K regression functions.

1 20. (Currently Amended) The system of claim 13, wherein the motion estimator is to extract
2 ~~extracts~~ data according to predetermined criteria.

1 21. (Currently Amended) The system of claim 20, wherein the motion estimator is to extract
2 ~~extracts~~ data according to color.

1 22. (Currently Amended) The system of claim 13, wherein the image sequence retrieval
2 module is to prepare ~~prepares~~ each of the data points as x-y-coordinate data points.

1 23. (Previously Presented) The system of claim 13 further comprising a processor for using
2 the K regression functions to render the image sequence with motion paths shown on a display.

1 24. (Original) The system of claim 23, wherein the processor overlays the K regression
2 functions on the video images to show motion between the current image and the first reference
3 image.

1 25. (Currently Amended) A method for estimating motion trials in video image sequences,
2 the method comprising:

3 providing data points representing information from an image sequence; and

4 performing, by a processor, regression clustering using a K-Harmonic Means function to
5 cluster the data points and to provide motion information regarding the data points,

6 wherein the performing regression clustering further comprises:

7 selecting a number, K, of regression clusters[[, K,]] for data points from an image
8 sequence;

9 initializing regression functions for each of the K clusters to estimate [[the]]
10 centers of motion for the data points;

11 calculating [[the]] distances from each data point to each of the K regression
12 functions;

13 calculating a membership probability and a weighting factor for each data point
14 based on distances between the K regression functions and each data point;

15 applying regression clustering using a K Harmonic Means function to recalculate
16 the K regression functions based at least on the membership probabilities;

17 determining whether changes comparing a change in membership
18 probabilities probability and a change or changes in the K regression functions satisfy a
19 stopping criterion; functions to a predetermined threshold; and

20 repeating calculating the distances, calculating the membership probability,
21 applying regression, and determining whether changes satisfy the stopping criterion if the
22 changes in membership probabilities or changes in the K regression functions do not
23 satisfy the stopping criterion; and

24 using motion paths represented by the K regression functions if when the
25 changes change in membership probabilities or probability and change changes in the K
26 regression functions satisfy the stopping criterion are less than a predetermined threshold.

1 26. (Cancelled)

1 27. (Currently Amended) A system for estimating motion trials in video image sequences,
2 comprising:

3 means for retrieving a current image and a first reference image and providing data points
4 representing information from the current image and the first reference image; and

5 means for performing regression clustering, coupled to the means for retrieving and
6 providing, wherein the means for performing regression clustering uses a K-Harmonic Means
7 function to cluster the data points and to provide motion information regarding the data points,

8 wherein the means for performing regression clustering further comprises means for
9 selecting a number, K, of regression clusters[[, K,]] for data points from an image sequence,
10 means for initializing regression functions for each of the K clusters to estimate [[the]] centers of
11 motion for the data points, means for calculating [[the]] distances from each data point to each of
12 the K regression functions, means for calculating a membership probability ~~and a weighting~~
13 ~~factor~~ for each data point based on distances between the K regression functions and each data
14 point, means for applying regression clustering ~~using a K Harmonic Means function~~ to
15 recalculate the K regression functions ~~based at least on the membership probabilities~~, ~~means for~~
16 ~~comparing a change determining whether changes~~ in membership probability ~~and a change~~
17 ~~probabilities or changes~~ in the K regression functions ~~satisfy a stopping criterion, repeating~~
18 ~~calculating the distances, calculating the membership probability, applying regression, and~~
19 ~~determining whether the changes satisfy the stopping criterion if tasks of the changes in~~
20 ~~membership probabilities or changes in the K regression functions do not satisfy the stopping~~
21 ~~criterion, to a predetermined threshold~~ and means for using motion paths represented by the K
22 regression functions ~~if the changes when the change in membership probability and change~~
23 ~~probabilities or changes~~ in the K regression functions ~~satisfy the stopping criterion are less than a~~
24 ~~predetermined threshold~~.

1 28.-29. (Cancelled)